



<110> Cole, David
Cummins, Ian
Edwards, Robert

<120> Plant Genes

<130> A33083-PCT-USA 072667.0127

<140> 09/508,710
<141> 2000-07-10

<150> PCT/GB98/02802
<151> 1998-09-16

<150> GB 971972.1
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<160> 19

<170> FastSEQ for Windows Version 3.0

<210> 1
<211> 1085
<212> DNA
<213> Triticum aestivum L.

<220>
<221> CDS
<222> (46) . . . (711)
<223> Glutathione S transferase

<400> 1

caaacacaag cacagatcggtcgagattca aggcaaccgg gagca atg gcg ggc gag 57
Met Ala Gly Glu
1

aag ggg ctg gtg ctg ctg gac ttc tgg gtg agc ccg ttc ggg cag cgc 105
Lys Gly Leu Val Leu Leu Asp Phe Trp Val Ser Pro Phe Gly Gln Arg
5 10 15 20

gtg cgc atc gct ctg gcc gag aag ggc ctg ccc tac gag tac gct gag 153
Val Arg Ile Ala Leu Ala Glu Lys Gly Leu Pro Tyr Glu Tyr Ala Glu
25 30 35

gag gac ctg atg gcc ggc aag agc gac cgc ctc ctc cgc gcc aac ccg 201
Glu Asp Leu Met Ala Gly Lys Ser Asp Arg Leu Leu Arg Ala Asn Pro
40 45 50

gtg cat aag aag atc ccg gtg ctc ctc cac gac ggc cgt gcc gtc aac 249

Val His Lys Lys Ile Pro Val Leu Leu His Asp Gly Arg Ala Val Asn				
55	60	65		
gag tcc ctc atc atc ctc cag tac ctg gag gag gcc ttc ccg gac gcg				297
Glu Ser Leu Ile Ile Leu Gln Tyr Leu Glu Glu Ala Phe Pro Asp Ala				
70	75	80		
ccc gct ctg ctc ccc tcc gac ccc tac gcg cgc gcg cag gcc cgc ttc				345
Pro Ala Leu Leu Pro Ser Asp Pro Tyr Ala Arg Ala Gln Ala Arg Phe				
85	90	95	100	
tgg gcc gac tac gtc gac aag aag gtc tac gac tgc ggc tcc cgc ctc				393
Trp Ala Asp Tyr Val Asp Lys Lys Val Tyr Asp Cys Gly Ser Arg Leu				
105	110	115		
tgg aag ctc aag ggc gag ccg cag gcg cag gcg cgc gac gag atg ctg				441
Trp Lys Leu Lys Gly Glu Pro Gln Ala Gln Ala Arg Ala Glu Met Leu				
120	125	130		
gac atc ctc aag acc ctc gac ggc gcg ctc ggg gac aag ccc ttc ttc				489
Asp Ile Leu Lys Thr Leu Asp Gly Ala Leu Gly Asp Lys Pro Phe Phe				
135	140	145		
ggc ggc gac aag ttc ggg ttc gtc gac gcc gcc ttc gcg ccc ttc acc				537
Gly Gly Asp Lys Phe Gly Phe Val Asp Ala Ala Phe Ala Pro Phe Thr				
150	155	160		
gcg tgg ttc cac agc tac gag agg tac ggc gag ttc agc ctg ccg gag				585
Ala Trp Phe His Ser Tyr Glu Arg Tyr Gly Glu Phe Ser Leu Pro Glu				
165	170	175	180	
gtg gcg ccc aag atc gcc gcg tgg gcc aag cgc tgc ggc gag cgg gag				633
Val Ala Pro Lys Ile Ala Ala Trp Ala Lys Arg Cys Gly Glu Arg Glu				
185	190	195		
agc gtc gcc aag agc ctc tac tcg ccg gac aag gtg tac gac ttc atc				681
Ser Val Ala Lys Ser Leu Tyr Ser Pro Asp Lys Val Tyr Asp Phe Ile				
200	205	210		
ggc ctg ctc aag aag tac ggc atc gag taggcgcgcc gacggacgga				731
Gly Leu Leu Lys Lys Tyr Gly Ile Glu				
215	220			
cggacgggcc atgcaggcga cagccggccc gccgtccgga gggaaagcaac aaataaatca				791
gggagcgatt tgggtggcct acaatgcgta cgctctggata gagtatttct ttctttcttt				851
cttcgtggaa taaagtgcgc cgtgtgtgtg tgggtgggttgg ttgttgggttgg gatcagtcag				911
tgtgtgtggg tgcgtgtgtgt gtactcagta ctgcgtatgt gtgtgtgtgt caatgtgtca				971
accctggctc tcgggtgggg cagcacccgag ttgccacctg ccattccatt tccattccgg				1031
gcatgatgata aataaaaaaaaa gatgttcatt tggtaaaaaaaaaaaaaaaa aaaaaaaa				1085

<210> 2

<211> 222

<212> PRT

<213> Triticum aestivum L.

<400> 2
Met Ala Gly Glu Lys Gly Leu Val Leu Leu Asp Phe Trp Val Ser Pro
1 5 10 15
Phe Gly Gln Arg Val Arg Ile Ala Leu Ala Glu Lys Gly Leu Pro Tyr
20 25 30
Glu Tyr Ala Glu Glu Asp Leu Met Ala Gly Lys Ser Asp Arg Leu Leu
35 40 45
Arg Ala Asn Pro Val His Lys Lys Ile Pro Val Leu Leu His Asp Gly
50 55 60
Arg Ala Val Asn Glu Ser Leu Ile Ile Leu Gln Tyr Leu Glu Glu Ala
65 70 75 80
Phe Pro Asp Ala Pro Ala Leu Leu Pro Ser Asp Pro Tyr Ala Arg Ala
85 90 95
Gln Ala Arg Phe Trp Ala Asp Tyr Val Asp Lys Lys Val Tyr Asp Cys
100 105 110
Gly Ser Arg Leu Trp Lys Leu Lys Gly Glu Pro Gln Ala Gln Ala Arg
115 120 125
Ala Glu Met Leu Asp Ile Leu Lys Thr Leu Asp Gly Ala Leu Gly Asp
130 135 140
Lys Pro Phe Phe Gly Gly Asp Lys Phe Gly Phe Val Asp Ala Ala Phe
145 150 155 160
Ala Pro Phe Thr Ala Trp Phe His Ser Tyr Glu Arg Tyr Gly Glu Phe
165 170 175
Ser Leu Pro Glu Val Ala Pro Lys Ile Ala Ala Trp Ala Lys Arg Cys
180 185 190
Gly Glu Arg Glu Ser Val Ala Lys Ser Leu Tyr Ser Pro Asp Lys Val
195 200 205
Tyr Asp Phe Ile Gly Leu Leu Lys Lys Lys Tyr Gly Ile Glu
210 215 220

<210> 3

<211> 865

<212> DNA

<213> Triticum aestivum L.

<220>

<221> CDS

<222> (54) ... (725)

<223> WIC 1

<400> 3
ggaactcaac cattgatctt caagaagcg aagcaaacag agcaaaaggt gtg atg 56
Met
1
gcg gcg ccg gcg gtg aag gtg tac ggg tgg gcg atg tcg ccg ttc gtg 104
Ala Ala Pro Ala Val Lys Val Tyr Gly Trp Ala Met Ser Pro Phe Val
5 10 15
gcg cgc gcg ctg ctg tgc ctg gag gag gcc ggc gtg gag tac gag ctc 152
Ala Arg Ala Leu Leu Cys Leu Glu Glu Ala Gly Val Glu Tyr Glu Leu

20	25	30	
gtc ccc atg agc cgc gag gcc gac cac cgc cag ccc gac ttc ctc			200
Val Pro Met Ser Arg Glu Ala Gly Asp His Arg Gln Pro Asp Phe Leu			
35	40	45	
gcc cgg aac ccc ttc ggc cag gtc ccc gtt ctc gag gac ggc gac ctc			248
Ala Arg Asn Pro Phe Gly Gln Val Pro Val Leu Glu Asp Gly Asp Leu			
50	55	60	65
acc atc ttc gag tcg cgc gcc gtc gcg agg cac gtg ctg cgc aag cac			296
Thr Ile Phe Glu Ser Arg Ala Val Ala Arg His Val Leu Arg Lys His			
70	75	80	
aaa ccg gag ctg ctg ggc tcc ggc tcg ccg gag tcg gcg gcg atg gtg			344
Lys Pro Glu Leu Leu Gly Ser Gly Ser Pro Glu Ser Ala Ala Met Val			
85	90	95	
gac gtg tgg ctg gag gtg gag gcc cac cag acc ccg gcg ggc			392
Asp Val Trp Leu Glu Val Glu Ala His Gln His Gln Thr Pro Ala Gly			
100	105	110	
acc atc gtc atg cag tgc atc ctc acc ccg ttc ctc ggc tgc cag cgc			440
Thr Ile Val Met Gln Cys Ile Leu Thr Pro Phe Leu Gly Cys Gln Arg			
115	120	125	
gac cag gcc gcc atc gac gag aac gcg gca aag ctg acg aat ctg ttc			488
Asp Gln Ala Ala Ile Asp Glu Asn Ala Ala Lys Leu Thr Asn Leu Phe			
130	135	140	145
gac gtg tac gag gcg cgc ctg tcg gcg tcg agg tac ctt gcc ggg gag			536
Asp Val Tyr Glu Ala Arg Leu Ser Ala Ser Arg Tyr Leu Ala Gly Glu			
150	155	160	
gcg gtc agc ctc gcg gac ctc agc cac ttc ccg ttc atg cga tac ttc			584
Ala Val Ser Leu Ala Asp Leu Ser His Phe Pro Phe Met Arg Tyr Phe			
165	170	175	
atg gac acc gag tac gcg ctg gtg gag gag cgc ccg cac gtg aag			632
Met Asp Thr Glu Tyr Ala Ser Leu Val Glu Glu Arg Pro His Val Lys			
180	185	190	
gcg tgg tgg gag gag ttc aag gcc agc ccg gcg gcg aag agg gtg acg			680
Ala Trp Trp Glu Glu Phe Lys Ala Ser Pro Ala Ala Lys Arg Val Thr			
195	200	205	
gag ttc atg ccg cca aac ttc ggg ttc gga aag aag gca gag aag			725
Glu Phe Met Pro Pro Asn Phe Gly Phe Gly Lys Lys Ala Glu Lys			
210	215	220	
tgatgacaag aacgaacacc gagcgaacat gttgtgtggt ctgtgcgacc cgaccatggc			785
tcaatgtttt gggctgtttg tgttcacgc atgaatgaat aaaacaaaat gctttgggt			845
ttcaaaaaaaaaaaaaaaaa			865

<210> 4
<211> 224
<212> PRT
<213> *Triticum aestivum L.*

<400> 4
Met Ala Ala Pro Ala Val Lys Val Tyr Gly Trp Ala Met Ser Pro Phe
1 5 10 15
Val Ala Arg Ala Leu Leu Cys Leu Glu Ala Gly Val Glu Tyr Glu
20 25 30
Leu Val Pro Met Ser Arg Glu Ala Gly Asp His Arg Gln Pro Asp Phe
35 40 45
Leu Ala Arg Asn Pro Phe Gly Gln Val Pro Val Leu Glu Asp Gly Asp
50 55 60
Leu Thr Ile Phe Glu Ser Arg Ala Val Ala Arg His Val Leu Arg Lys
65 70 75 80
His Lys Pro Glu Leu Leu Gly Ser Gly Ser Pro Glu Ser Ala Ala Met
85 90 95
Val Asp Val Trp Leu Glu Val Glu Ala His Gln His Gln Thr Pro Ala
100 105 110
Gly Thr Ile Val Met Gln Cys Ile Leu Thr Pro Phe Leu Gly Cys Gln
115 120 125
Arg Asp Gln Ala Ala Ile Asp Glu Asn Ala Ala Lys Leu Thr Asn Leu
130 135 140
Phe Asp Val Tyr Glu Ala Arg Leu Ser Ala Ser Arg Tyr Leu Ala Gly
145 150 155 160
Glu Ala Val Ser Leu Ala Asp Leu Ser His Phe Pro Phe Met Arg Tyr
165 170 175
Phe Met Asp Thr Glu Tyr Ala Ser Leu Val Glu Glu Arg Pro His Val
180 185 190
Lys Ala Trp Trp Glu Glu Phe Lys Ala Ser Pro Ala Ala Lys Arg Val
195 200 205
Thr Glu Phe Met Pro Pro Asn Phe Gly Phe Gly Lys Lys Ala Glu Lys
210 215 220

<210> 5
<211> 930
<212> DNA
<213> *Triticum aestivum L.*

<220>
<221> CDS
<222> (60)...(725)
<223> WIC 2

<400> 5
cacgcgtcca tctccaagaa gcggaagcta gtggagcaga gcaaaccaag caaggttgg 59
atg gcg ccg gcg gtg aag gtg tac ggg tgg gcc gtg tcg ccg ttc gtg 107
Met Ala Pro Ala Val Lys Val Tyr Gly Trp Ala Val Ser Pro Phe Val
1 5 10 15
gag cgc cca ctg ctg tgc ctg gag gag gcc ggc gtc gag tac gag ctc 155
Ala Arg Pro Leu Leu Cys Leu Glu Ala Gly Val Glu Tyr Glu Leu

20	25	30	
gtg tcc atg agc cgc gcg gcc ggc gac cac cgc cag ccg gac ttc ctc			203
Val Ser Met Ser Arg Ala Ala Gly Asp His Arg Gln Pro Asp Phe Leu			
35	40	45	
gcc cgg aac ccc ttc ggc cag gtc ccc gtc ctc gag gac ggc gac ctc			251
Ala Arg Asn Pro Phe Gly Gln Val Pro Val Leu Glu Asp Gly Asp Leu			
50	55	60	
acc ctc ttc gag tcg cgc gcg atc gcg agg cac gtg ctc cgg aag cac			299
Thr Leu Phe Glu Ser Arg Ala Ile Ala Arg His Val Leu Arg Lys His			
65	70	75	80
aag ccg gag ctg ctg ggc tgc ggc ccg gag gcg gag ggc atg gtg			347
Lys Pro Glu Leu Leu Gly Cys Ser Pro Glu Ala Glu Ala Met Val			
85	90	95	
gac gtg tgg ctg gag gtg gag gcc cac cag tac aac ccc gcg gcc agc			395
Asp Val Trp Leu Glu Val Ala His Gln Tyr Asn Pro Ala Ala Ser			
100	105	110	
gcc atc gtg gtg cag tgc atc atc ttg ccg cta ctg ggc ggc gcg cgg			443
Ala Ile Val Val Gln Cys Ile Leu Pro Leu Leu Gly Gly Ala Arg			
115	120	125	
gac cag gcg gtg gtg gac gag aac gta gcc aag ctc aag aag gtg ctg			491
Asp Gln Ala Val Val Asp Glu Asn Val Ala Lys Leu Lys Lys Val Leu			
130	135	140	
gag gtg tac gag gca cgg ctg tcg gcg tcc agg tac ctc gcc ggg gac			539
Glu Val Tyr Glu Ala Arg Leu Ser Ala Ser Arg Tyr Leu Ala Gly Asp			
145	150	155	160
gac atc agc ctc gcc gac ctc agc cac ttc ccc ttc acg cgc tac ttc			587
Asp Ile Ser Leu Ala Asp Leu Ser His Phe Pro Phe Thr Arg Tyr Phe			
165	170	175	
atg gag acg gag tac gcg ccg ctg gtg gcg gag ctc ccc cac gtg aac			635
Met Glu Thr Glu Tyr Ala Pro Leu Val Ala Glu Leu Pro His Val Asn			
180	185	190	
gcg tgg tgg gag ggg ctc aag gcc agg ccg gcc gcg agg aag gtg acg			683
Ala Trp Trp Glu Gly Leu Lys Ala Arg Pro Ala Ala Arg Lys Val Thr			
195	200	205	
gag ctc atg ccg ccg gac ctt ggg ctt gga aag aaa gca gag			725
Glu Leu Met Pro Pro Asp Leu Gly Leu Gly Lys Ala Glu			
210	215	220	
tagtgatgac tgccgccaac gttcaccagg atcgagcaag tcactgtcga gtctccgggtt			785
ttgcgttgta cgccaccggg gcaccggcct atatttctg taccagtggc tcgttttttg			845
atgttttagt ctcacgcttg aataaaatgc aagatataacc catcggttct aaaagaaaaaa			905

aaaaaaaaaaa aaaaaaaaaaa aaaaa

930

<210> 6
<211> 222
<212> PRT
<213> Triticum aestivum L.

<400> 6
Met Ala Pro Ala Val Lys Val Tyr Gly Trp Ala Val Ser Pro Phe Val
1 5 10 15
Ala Arg Pro Leu Leu Cys Leu Glu Glu Ala Gly Val Glu Tyr Glu Leu
20 25 30
Val Ser Met Ser Arg Ala Ala Gly Asp His Arg Gln Pro Asp Phe Leu
35 40 45
Ala Arg Asn Pro Phe Gly Gln Val Pro Val Leu Glu Asp Gly Asp Leu
50 55 60
Thr Leu Phe Glu Ser Arg Ala Ile Ala Arg His Val Leu Arg Lys His
65 70 75 80
Lys Pro Glu Leu Leu Gly Cys Gly Ser Pro Glu Ala Glu Ala Met Val
85 90 95
Asp Val Trp Leu Glu Val Glu Ala His Gln Tyr Asn Pro Ala Ala Ser
100 105 110
Ala Ile Val Val Gln Cys Ile Ile Leu Pro Leu Leu Gly Gly Ala Arg
115 120 125
Asp Gln Ala Val Val Asp Glu Asn Val Ala Lys Leu Lys Lys Val Leu
130 135 140
Glu Val Tyr Glu Ala Arg Leu Ser Ala Ser Arg Tyr Leu Ala Gly Asp
145 150 155 160
Asp Ile Ser Leu Ala Asp Leu Ser His Phe Pro Phe Thr Arg Tyr Phe
165 170 175
Met Glu Thr Glu Tyr Ala Pro Leu Val Ala Glu Leu Pro His Val Asn
180 185 190
Ala Trp Trp Glu Gly Leu Lys Ala Arg Pro Ala Ala Arg Lys Val Thr
195 200 205
Glu Leu Met Pro Pro Asp Leu Gly Leu Gly Lys Lys Ala Glu
210 215 220

<210> 7
<211> 927
<212> DNA
<213> Triticum aestivum L.

<220>
<221> CDS
<222> (72)...(707)
<223> WIC 3, WIC 7, and WIC 8

<400> 7
agcggcttta cctaccgaga agaagagaga aaaaagggttc gagtgcggttc cagagtggagg 60
agtgagaaga g atg gct ccg gtg aag ctg tac ggc gcg acc ctg tcg tgg 110
Met Ala Pro Val Lys Leu Tyr Gly Ala Thr Leu Ser Trp
1 5 10

aac gtc acc agg tgc gtg gcg gcg ctg gag qag gcc ggc gtc cag tac Asn Val Thr Arg Cys Val Ala Ala Leu Glu Glu Ala Gly Val Gln Tyr 15 20 25	158
gag atc gta ccc atc aac ttc ggc acc ggc gag cac aag agc ccc gac Glu Ile Val Pro Ile Asn Phe Gly Thr Gly Glu His Lys Ser Pro Asp 30 35 40 45	206
cac ctc gcc agg aac ccc ttc ggc cag gtg cca gct ttg cag gat ggt His Leu Ala Arg Asn Pro Phe Gly Gln Val Pro Ala Leu Gln Asp Gly 50 55 60	254
gac tta tac gtc ttc gaa tca cgt gct att tgc aag tac gcg tgc cgc Asp Leu Tyr Val Phe Glu Ser Arg Ala Ile Cys Lys Tyr Ala Cys Arg 65 70 75	302
aag aac aag cca gag ctg ttg aag gag ggc gac atc aag gag tca gca Lys Asn Lys Pro Glu Leu Leu Lys Glu Gly Asp Ile Lys Glu Ser Ala 80 85 90	350
atg gtg gat gtg tgg ctc gag gtg gag gcc cat cag tac act gcc gct Met Val Asp Val Trp Leu Glu Val Ala His Gln Tyr Thr Ala Ala 95 100 105	398
ctg agc ccc att ctc ttc gag tgc ctt atc cat cca atg ctt ggg gga Leu Ser Pro Ile Leu Phe Glu Cys Leu Ile His Pro Met Leu Gly Gly 110 115 120 125	446
gcc act gac cag aag gtc atc gac gac aac ctt gtt aag atc aag aac Ala Thr Asp Gln Lys Val Ile Asp Asp Asn Leu Val Lys Ile Lys Asn 130 135 140	494
gtg ctg gcg gtg tac gag gcg cac ctg agc aag tcc aag tac ctg gct Val Leu Ala Val Tyr Glu Ala His Leu Ser Lys Ser Lys Tyr Leu Ala 145 150 155	542
gga gac ttc ctc agt ctt gcg gac ctt aac cat gtg tct gtc acc ctg Gly Asp Phe Leu Ser Leu Ala Asp Leu Asn His Val Ser Val Thr Leu 160 165 170	590
tgc ttg gcg gct aca ccc tat gcg tct ctg ttc gac gcg tac ccg cat Cys Leu Ala Ala Thr Pro Tyr Ala Ser Leu Phe Asp Ala Tyr Pro His 175 180 185	638
gtg aag gcc tgg tgg act gac ctg ctg gcg agg ccg tcc gtc cag aag Val Lys Ala Trp Trp Thr Asp Leu Leu Ala Arg Pro Ser Val Gln Lys 190 195 200 205	686
gtc gca gcg ctg atg aag cca tgatcttaat tgctggtgct cgttcgctcg Val Ala Ala Leu Met Lys Pro 210	737
gaaataagcc gaggtgtgtg ccccccgtat tggtgcgtat cgagtggtgtg ttcttgat	797

gtctcctcgt gttgaatgtt caggcttgc cttgcgatcc tgtctcatct tttactgaaa 857
tgagcggtcc tatgctctgg ttataataata aattgtgcct agatattatc tcaaaaaaaaaa 917
aaaaaaaaaa 927

<210> 8
<211> 212
<212> PRT
<213> *Triticum aestivum L.*

<400> 8
Met Ala Pro Val Lys Leu Tyr Gly Ala Thr Leu Ser Trp Asn Val Thr
1 5 10 15
Arg Cys Val Ala Ala Leu Glu Glu Ala Gly Val Gln Tyr Glu Ile Val
20 25 30
Pro Ile Asn Phe Gly Thr Gly Glu His Lys Ser Pro Asp His Leu Ala
35 40 45
Arg Asn Pro Phe Gly Gln Val Pro Ala Leu Gln Asp Gly Asp Leu Tyr
50 55 60
Val Phe Glu Ser Arg Ala Ile Cys Lys Tyr Ala Cys Arg Lys Asn Lys
65 70 75 80
Pro Glu Leu Leu Lys Glu Gly Asp Ile Lys Glu Ser Ala Met Val Asp
85 90 95
Val Trp Leu Glu Val Glu Ala His Gln Tyr Thr Ala Ala Leu Ser Pro
100 105 110
Ile Leu Phe Glu Cys Leu Ile His Pro Met Leu Gly Gly Ala Thr Asp
115 120 125
Gln Lys Val Ile Asp Asp Asn Leu Val Lys Ile Lys Asn Val Leu Ala
130 135 140
Val Tyr Glu Ala His Leu Ser Lys Ser Lys Tyr Leu Ala Gly Asp Phe
145 150 155 160
Leu Ser Leu Ala Asp Leu Asn His Val Ser Val Thr Leu Cys Leu Ala
165 170 175
Ala Thr Pro Tyr Ala Ser Leu Phe Asp Ala Tyr Pro His Val Lys Ala
180 185 190
Trp Trp Thr Asp Leu Leu Ala Arg Pro Ser Val Gln Lys Val Ala Ala
195 200 205
Leu Met Lys Pro
210

<210> 9
<211> 866
<212> DNA
<213> *Triticum aestivum L.*

<220>
<221> CDS
<222> (45)...(683)
<223> WIC 5

<400> 9
gaaggcaggca acaggcgagc aggaaggaag caagagaggt ggag atg gcg ccc atc 56
Met Ala Pro Ile
1

aag ctg tac ggg atg atg ctg tcg gcc aac gtg acc cgc gtg acc acg Lys Leu Tyr Gly Met Met Leu Ser Ala Asn Val Thr Arg Val Thr Thr	5	10	15	20	104
ctg ctc aac gag ctc ggc ctc gag ttc gac ttc gtc gac gtc gac ctc Leu Leu Asn Glu Leu Gly Leu Glu Phe Asp Phe Val Asp Val Asp Leu	25	30	35		152
cgc acc ggc gcc cac aag cac ccc gac ttc ctc aag ctc aac cct ttc Arg Thr Gly Ala His His Pro Asp Phe Leu Lys Leu Asn Pro Phe	40	45	50		200
ggc cag atc ccc gcg ctg cag gac gga gac gaa gtt gtc ttc gag tcg Gly Gln Ile Pro Ala Leu Gln Asp Gly Asp Glu Val Val Phe Glu Ser	55	60	65		248
cgc gcc atc aac cgg tac atc gcg acc aag tac ggg gcg tcc ctg ctg Arg Ala Ile Asn Arg Tyr Ile Ala Thr Lys Tyr Gly Ala Ser Leu Leu	70	75	80		296
ccg acg ccg tcg gcc aag ctg gag gcg tgg ctg gag gtg gag tcg cac Pro Thr Pro Ser Ala Lys Leu Glu Ala Trp Leu Glu Val Glu Ser His	85	90	95	100	344
cac ttc tac ccg ccg gcg acg ctg gtg tac gag ctg gtc atc aag His Phe Tyr Pro Pro Ala Arg Thr Leu Val Tyr Glu Leu Val Ile Lys	105	110	115		392
ccc atg ctg ggc gcc ccc acc gac gcc gag gtg gac aag aac gcc Pro Met Leu Gly Ala Pro Thr Asp Ala Ala Glu Val Asp Lys Asn Ala	120	125	130		440
gcc gac ctc gcc aag ctg ctc gac gtc tac gag gcc cac ctc gcc gcc Ala Asp Leu Ala Lys Leu Leu Asp Val Tyr Glu Ala His Leu Ala Ala	135	140	145		488
ggg aac aag tac ctg gcc ggc gac gcc ttc ccg ctc gcc gac gcc aac Gly Asn Lys Tyr Leu Ala Gly Asp Ala Phe Pro Leu Ala Asp Ala Asn	150	155	160		536
cac atg tcc tac ctc ttc atg ctc acc aag agc ccc aag gcg gac ctg His Met Ser Tyr Leu Phe Met Leu Thr Lys Ser Pro Lys Ala Asp Leu	165	170	175	180	584
gtg gcc tcc ccg cac gtc aag gcc tgg tgg gag gag atc tcc gcc Val Ala Ser Arg Pro His Val Lys Ala Trp Trp Glu Glu Ile Ser Ala	185	190	195		632
cgc ccc gcc tgg gcc aag acc gtc gcc tcc atc ccc ctc ccg ccc gcc Arg Pro Ala Trp Ala Lys Thr Val Ala Ser Ile Pro Leu Pro Pro Ala	200	205	210		680

gtc tgagggtgct tggttggctg cggcgagaac ggaataaaat cgcgatgatg 733
Val

gaataaaacaa ctttttagag aggaagctt gattttttgg tgttgctgct gttgaatgtt 793
gaatcttgggt gttgaatgtt tacggcacat ctaatttatac cagttttttt ggcgtgaaaaa 853
aaaaaaaaaaa aaa 866

<210> 10
<211> 213
<212> PRT
<213> Triticum aestivum L.

<400> 10
Met Ala Pro Ile Lys Leu Tyr Gly Met Met Leu Ser Ala Asn Val Thr 1 5 10 15
Arg Val Thr Thr Leu Leu Asn Glu Leu Gly Leu Glu Phe Asp Phe Val 20 25 30
Asp Val Asp Leu Arg Thr Gly Ala His Lys His Pro Asp Phe Leu Lys 35 40 45
Leu Asn Pro Phe Gly Gln Ile Pro Ala Leu Gln Asp Gly Asp Glu Val 50 55 60
Val Phe Glu Ser Arg Ala Ile Asn Arg Tyr Ile Ala Thr Lys Tyr Gly 65 70 75 80
Ala Ser Leu Leu Pro Thr Pro Ser Ala Lys Leu Glu Ala Trp Leu Glu 85 90 95
Val Glu Ser His His Phe Tyr Pro Pro Ala Arg Thr Leu Val Tyr Glu 100 105 110
Leu Val Ile Lys Pro Met Leu Gly Ala Pro Thr Asp Ala Ala Glu Val 115 120 125
Asp Lys Asn Ala Ala Asp Leu Ala Lys Leu Leu Asp Val Tyr Glu Ala 130 135 140
His Leu Ala Ala Gly Asn Lys Tyr Leu Ala Gly Asp Ala Phe Pro Leu 145 150 155 160
Ala Asp Ala Asn His Met Ser Tyr Leu Phe Met Leu Thr Lys Ser Pro 165 170 175
Lys Ala Asp Leu Val Ala Ser Arg Pro His Val Lys Ala Trp Trp Glu 180 185 190
Glu Ile Ser Ala Arg Pro Ala Trp Ala Lys Thr Val Ala Ser Ile Pro 195 200 205
Leu Pro Pro Ala Val
210

<210> 11
<211> 897
<212> DNA
<213> Triticum aestivum L.

<220>
<221> CDS
<222> (15)...(668)
<223> WIC 4 and WIC 10

<221> gene
<222> (1)...(897)
<223> WIC 4 cDNA

<400> 11

aaccaaggga aaca atg gcg ccg gtg aag gtg ttc ggg ccg gcg atg tcg	50
Met Ala Pro Val Lys Val Phe Gly Pro Ala Met Ser	
1 5 10	
acc aac gtg gcc cggtg ctg tgc ctg gag gag gtc ggc gcc gag	98
Thr Asn Val Ala Arg Val Leu Val Cys Leu Glu Val Gly Ala Glu	
15 20 25	
tac gag gtg gtc gac atc gat ttc aag gcc atg gag cac aag agc ccc	146
Tyr Glu Val Val Asp Ile Asp Phe Lys Ala Met Glu His Lys Ser Pro	
30 35 40	
gag cat ctc gtc aga aac ccg ttc ggc caa atc cct gcc ttc cag gat	194
Glu His Leu Val Arg Asn Pro Phe Gly Gln Ile Pro Ala Phe Gln Asp	
45 50 55 60	
ggg gat ctg ctt ctc ttc gag tca cgc gca att gcg agg tac gtg ctc	242
Gly Asp Leu Leu Leu Phe Glu Ser Arg Ala Ile Ala Arg Tyr Val Leu	
65 70 75	
cgc aag tac aag aag aac gaa gtg gac ctg ctg agg gaa ggc gac ctc	290
Arg Lys Tyr Lys Asn Glu Val Asp Leu Leu Arg Glu Gly Asp Leu	
80 85 90	
aag gag gcg gcg atg gtg gac gta tgg acg gag gtg gac gcg cac acc	338
Lys Glu Ala Ala Met Val Asp Val Trp Thr Glu Val Asp Ala His Thr	
95 100 105	
tac aac ccg gcc atc tcg ccg atc gtg tac gag tgc tca tca acc gct	386
Tyr Asn Pro Ala Ile Ser Pro Ile Val Tyr Glu Cys Ser Ser Thr Ala	
110 115 120	
cat gcg ccg ctg ccg acc aac caa acg gtg gtg gac gag agc ctg gag	434
His Ala Arg Leu Pro Thr Asn Gln Thr Val Val Asp Glu Ser Leu Glu	
125 130 135 140	
aag ctc aag aac gtg ctg gag gtc tac gag gcg cgc ctg tcc aag cac	482
Lys Leu Lys Asn Val Leu Glu Val Tyr Glu Ala Arg Leu Ser Lys His	
145 150 155	
gac tac ctc gcc ggg gac ttc gtc agc ttc gcg gac ctc aac cac ttc	530
Asp Tyr Leu Ala Gly Asp Phe Val Ser Phe Ala Asp Leu Asn His Phe	
160 165 170	
ccc tac acc ttc tac ttc atg gcc acg ccg cac gcg gcc ctc ttc gac	578
Pro Tyr Thr Phe Tyr Phe Met Ala Thr Pro His Ala Ala Leu Phe Asp	
175 180 185	

tcg tac ccg cac gtc aag gcc tgg tgg gag agg atc atg gcg agg ccg 626
Ser Tyr Pro His Val Lys Ala Trp Trp Glu Arg Ile Met Ala Arg Pro
190 195 200

gcc gtg aag aag ctc gcc gcg cag atg gtt ccc aag aag ccg 668
Ala Val Lys Lys Leu Ala Ala Gln Met Val Pro Lys Lys Pro
205 210 215

tgatttgcta ggcgggatct cgcatcgtagtgg gatccgattc cgatcactga tctgtgtggc 728
gtttttttttt cttgttggtg tcgcgaataa ggcaaattgag ctcgtgtgtg tggctggaa 788
attgcaccag cgtgcagttt ttgcgcttg cgtgtgtgtg gtcgtaaaaa ctcttgagat 848
ggaacaatgt cttcgtaatg ctttcacatt taaaaaaaaaaaaaaa 897

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<212> PRT
<213> *Triticum aestivum L.*

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Asp Ile Asp Phe Lys Ala Met Glu His Lys Ser Pro Glu His Leu Val
35 40 45
Arg Asn Pro Phe Gly Gln Ile Pro Ala Phe Gln Asp Gly Asp Leu Leu
50 55 60
Leu Phe Glu Ser Arg Ala Ile Ala Arg Tyr Val Leu Arg Lys Tyr Lys
65 70 75 80
Lys Asn Glu Val Asp Leu Leu Arg Glu Gly Asp Leu Lys Glu Ala Ala
85 90 95
Met Val Asp Val Trp Thr Glu Val Asp Ala His Thr Tyr Asn Pro Ala
100 105 110
Ile Ser Pro Ile Val Tyr Glu Cys Ser Ser Thr Ala His Ala Arg Leu
115 120 125
Pro Thr Asn Gln Thr Val Val Asp Glu Ser Leu Glu Lys Leu Lys Asn
130 135 140
Val Leu Glu Val Tyr Glu Ala Arg Leu Ser Lys His Asp Tyr Leu Ala
145 150 155 160
Gly Asp Phe Val Ser Phe Ala Asp Leu Asn His Phe Pro Tyr Thr Phe
165 170 175
Tyr Phe Met Ala Thr Pro His Ala Ala Phe Asp Ser Tyr Pro His
180 185 190
Val Lys Ala Trp Trp Glu Arg Ile Met Ala Arg Pro Ala Val Lys Lys
195 200 205
Leu Ala Ala Gln Met Val Pro Lys Lys Pro
210 215

<210> 13
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<212> DNA
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<220>

<221> CDS

<222> (21)...(686)

<223> Glutathione S transferase

<221> gene

<222> (1)...(721)

<223> TA 27 cDNA

<400> 13

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Ser Pro Trp Met Ala Arg Val Leu Val Ser Leu Glu Ala Gly Ala
15 20 25

gac tac gag ctc gtg ccc atg agc cgc aac ggc ggc gac cac cgq cgq 149
Asp Tyr Glu Leu Val Pro Met Ser Arg Asn Gly Gly Asp His Arg Arg
30 35 40

ccg gag cac ctc gcc aga aac ccc ttc ggt gag atc ccg gtg ctc gaa 197
Pro Glu His Leu Ala Arg Asn Pro Phe Gly Glu Ile Pro Val Leu Glu
45 50 55

tac ggc ggt ctg acg ctt tac caa tcc cgc gcc att gca agg cat att 245
Tyr Gly Leu Thr Leu Tyr Gln Ser Arg Ala Ile Ala Arg His Ile
60 65 70 75

ctc cgc aaa cac aag ccc ggg ctt cta gga gca ggc agc ctc gag gag 293
Leu Arg Lys His Lys Pro Gly Leu Leu Gly Ala Gly Ser Leu Glu Glu
80 85 90

tcg gcg atg gtg gat gta tgg gtc gac gtg gat gcc cac cac ctg gag 341
Ser Ala Met Val Asp Val Trp Val Asp Val Asp Ala His His Leu Glu
95 100 105

ccc gta ctc aag ccc atc gtg tgg aac tgc atc atc aac ccg ttc gtc 389
Pro Val Leu Lys Pro Ile Val Trp Asn Cys Ile Ile Asn Pro Phe Val
110 115 120

ggg agg gac gtc gac cag ggc ctc gtc gat gag agc gtc gag aag ctc 437
Gly Arg Asp Val Asp Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu
125 130 135

aag aag ctg ctg gag gtg tac gag gca aga ctg tca agc aac aag tac 485
Lys Lys Leu Leu Glu Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr
140 145 150 155

ttg gcc ggg gat ttc gtc agc ttc gcc gac ctc acc cat ttc tcc ttc 533
Leu Ala Gly Asp Phe Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe
160 165 170

atg cgc tac ttc atg gcg acg gag cat gcg gtt gtg ctc gat gcg tat	581																								
Met Arg Tyr Phe Met Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr																									
175	180	185		ccg cat gtg aag gca tgg tgg aag gcg ctg ctg gca agg cca tcg gtc	629	Pro His Val Lys Ala Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val		190	195	200		aag aag gtg ata gct ggc atg cct ccg gat ttt gga ttc ggg agc ggg	677	Lys Lys Val Ile Ala Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly		205	210	215		aga ata cca tgataaaagca tgcttgggg tctatgtatgc tctga	721	Arg Ile Pro		220	
185																									
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Pro His Val Lys Ala Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val																									
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200																									
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Lys Lys Val Ile Ala Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly																									
205	210	215		aga ata cca tgataaaagca tgcttgggg tctatgtatgc tctga	721	Arg Ile Pro		220																	
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Arg Ile Pro																									
220																									

<210> 14
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 <213> *Triticum aestivum L.*

<400> 14																																																																																	
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10	15																																																																																
Arg Val Leu Val Ser Leu Glu Ala Gly Ala Asp Tyr Glu Leu Val																																																																																	
20	25	30		Pro Met Ser Arg Asn Gly Gly Asp His Arg Arg Pro Glu His Leu Ala		35	40	45		Arg Asn Pro Phe Gly Glu Ile Pro Val Leu Glu Tyr Gly Gly Leu Thr		50	55	60		Leu Tyr Gln Ser Arg Ala Ile Ala Arg His Ile Leu Arg Lys His Lys		65	70	75	80	Pro Gly Leu Leu Gly Ala Gly Ser Leu Glu Glu Ser Ala Met Val Asp		85	90	95		Val Trp Val Asp Val Asp Ala His His Leu Glu Pro Val Leu Lys Pro		100	105	110		Ile Val Trp Asn Cys Ile Ile Asn Pro Phe Val Gly Arg Asp Val Asp		115	120	125		Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu Lys Lys Leu Glu		130	135	140		Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe		145	150	155	160	Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met		165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220							
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Pro Met Ser Arg Asn Gly Gly Asp His Arg Arg Pro Glu His Leu Ala																																																																																	
35	40	45		Arg Asn Pro Phe Gly Glu Ile Pro Val Leu Glu Tyr Gly Gly Leu Thr		50	55	60		Leu Tyr Gln Ser Arg Ala Ile Ala Arg His Ile Leu Arg Lys His Lys		65	70	75	80	Pro Gly Leu Leu Gly Ala Gly Ser Leu Glu Glu Ser Ala Met Val Asp		85	90	95		Val Trp Val Asp Val Asp Ala His His Leu Glu Pro Val Leu Lys Pro		100	105	110		Ile Val Trp Asn Cys Ile Ile Asn Pro Phe Val Gly Arg Asp Val Asp		115	120	125		Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu Lys Lys Leu Glu		130	135	140		Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe		145	150	155	160	Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met		165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220													
45																																																																																	
Arg Asn Pro Phe Gly Glu Ile Pro Val Leu Glu Tyr Gly Gly Leu Thr																																																																																	
50	55	60		Leu Tyr Gln Ser Arg Ala Ile Ala Arg His Ile Leu Arg Lys His Lys		65	70	75	80	Pro Gly Leu Leu Gly Ala Gly Ser Leu Glu Glu Ser Ala Met Val Asp		85	90	95		Val Trp Val Asp Val Asp Ala His His Leu Glu Pro Val Leu Lys Pro		100	105	110		Ile Val Trp Asn Cys Ile Ile Asn Pro Phe Val Gly Arg Asp Val Asp		115	120	125		Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu Lys Lys Leu Glu		130	135	140		Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe		145	150	155	160	Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met		165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																			
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Leu Tyr Gln Ser Arg Ala Ile Ala Arg His Ile Leu Arg Lys His Lys																																																																																	
65	70	75	80	Pro Gly Leu Leu Gly Ala Gly Ser Leu Glu Glu Ser Ala Met Val Asp		85	90	95		Val Trp Val Asp Val Asp Ala His His Leu Glu Pro Val Leu Lys Pro		100	105	110		Ile Val Trp Asn Cys Ile Ile Asn Pro Phe Val Gly Arg Asp Val Asp		115	120	125		Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu Lys Lys Leu Glu		130	135	140		Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe		145	150	155	160	Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met		165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																									
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Pro Gly Leu Leu Gly Ala Gly Ser Leu Glu Glu Ser Ala Met Val Asp																																																																																	
85	90	95		Val Trp Val Asp Val Asp Ala His His Leu Glu Pro Val Leu Lys Pro		100	105	110		Ile Val Trp Asn Cys Ile Ile Asn Pro Phe Val Gly Arg Asp Val Asp		115	120	125		Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu Lys Lys Leu Glu		130	135	140		Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe		145	150	155	160	Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met		165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																															
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Val Trp Val Asp Val Asp Ala His His Leu Glu Pro Val Leu Lys Pro																																																																																	
100	105	110		Ile Val Trp Asn Cys Ile Ile Asn Pro Phe Val Gly Arg Asp Val Asp		115	120	125		Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu Lys Lys Leu Glu		130	135	140		Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe		145	150	155	160	Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met		165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																																					
110																																																																																	
Ile Val Trp Asn Cys Ile Ile Asn Pro Phe Val Gly Arg Asp Val Asp																																																																																	
115	120	125		Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu Lys Lys Leu Glu		130	135	140		Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe		145	150	155	160	Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met		165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																																											
125																																																																																	
Gln Gly Leu Val Asp Glu Ser Val Glu Lys Leu Lys Lys Leu Glu																																																																																	
130	135	140		Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe		145	150	155	160	Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met		165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																																																	
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Val Tyr Glu Ala Arg Leu Ser Ser Asn Lys Tyr Leu Ala Gly Asp Phe																																																																																	
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155	160																																																																																
Val Ser Phe Ala Asp Leu Thr His Phe Ser Phe Met Arg Tyr Phe Met																																																																																	
165	170	175		Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala		180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																																																													
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Ala Thr Glu His Ala Val Val Leu Asp Ala Tyr Pro His Val Lys Ala																																																																																	
180	185	190		Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala		195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																																																																			
190																																																																																	
Trp Trp Lys Ala Leu Leu Ala Arg Pro Ser Val Lys Lys Val Ile Ala																																																																																	
195	200	205		Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro		210	215	220																																																																									
205																																																																																	
Gly Met Pro Pro Asp Phe Gly Phe Gly Ser Gly Arg Ile Pro																																																																																	
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<210> 15
 <211> 926
 <212> DNA
 <213> *Triticum aestivum* L.

 <220>
 <221> CDS
 <222> (66)...(764)
 <223> Glutathione S transferase

 <221> gene
 <222> (1)...(926)
 <223> cDNA clone ICR

 <400> 15

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Met	Ala	Gly	Asp	Gly	Glu	Leu	Lys	Leu	Leu	Gly	Val	Trp	Thr	Ser		
1	5					10						15				
ccg	tcc	gtc	atc	agg	gtg	cgc	gtg	gtg	ctc	aac	ctc	aag	tcg	ctg	ccg	158
Pro	Phe	Val	Ile	Arg	Val	Arg	Val	Val	Leu	Asn	Leu	Lys	Ser	Leu	Pro	
20	25												30			
tac	gag	tac	gtg	gag	gag	agc	ctg	ggc	agc	aag	agc	gag	ctc	ctc	ctg	206
Tyr	Glu	Tyr	Val	Glu	Glu	Ser	Leu	Gly	Ser	Lys	Ser	Ala	Leu	Leu	Leu	
35	40												45			
ggc	tcc	aac	ccg	gtg	cac	cag	agc	gtg	ccc	gtc	ctc	ctc	cac	ggc	ggc	254
Gly	Ser	Asn	Pro	Val	His	Gln	Ser	Val	Pro	Val	Leu	Leu	His	Gly	Gly	
50	55												60			
cgc	ccc	gtg	aac	gag	tcc	cag	gtc	atc	gtg	cag	tac	atc	gac	gag	gtc	302
Arg	Pro	Val	Asn	Glu	Ser	Gln	Val	Ile	Val	Gln	Tyr	Ile	Asp	Glu	Val	
65	70												75			
tgg	gct	ggg	gcc	ggc	ccg	tcc	gtg	ctc	ccg	gcc	gac	ccc	tac	gag	cgc	350
Trp	Ala	Gly	Ala	Gly	Pro	Ser	Val	Leu	Pro	Ala	Asp	Pro	Tyr	Glu	Arg	
80	85												95			
gcc	acg	gct	ccg	tcc	tgg	gct	gct	gtc	gac	gac	aag	gtc	ggg	tcg	398	
Ala	Thr	Ala	Arg	Phe	Trp	Ala	Ala	Tyr	Val	Asp	Asp	Lys	Val	Gly	Ser	
100	105												110			
gct	tggt	acg	ggg	atg	ctc	ttc	tcg	tgc	aag	acg	gag	gag	gag	cggt	gct	446
Ala	Trp	Thr	Gly	Met	Leu	Phe	Ser	Cys	Lys	Thr	Glu	Glu	Glu	Arg	Ala	
115	120												125			
gag	gct	gtg	tcc	ccg	gcc	gtg	gct	gct	gag	acc	ctg	gag	ggc	gct	494	
Glu	Ala	Val	Ser	Arg	Ala	Val	Ala	Ala	Leu	Glu	Thr	Leu	Glu	Gly	Ala	
130	135												140			
ttc	gct	gag	tgc	tcc	aag	ggg	aag	gct	ttc	ttc	ggc	ggc	gac	gcc	atc	542

Phe Ala Glu Cys Ser Lys Gly Lys Ala Phe Phe Gly Gly Asp Ala Ile			
145	150	155	
ggg ttc gtc gac gtc gtg ctt ggc ggc tac ctc ggc tgg ttc ggc gcg			590
Gly Phe Val Asp Val Val Leu Gly Gly Tyr Leu Gly Trp Phe Gly Ala			
160	165	170	175
atc gac aag atc atc ggg cgc cggtc atc gac ccg gcg agg acg ccg			638
Ile Asp Lys Ile Ile Gly Arg Arg Leu Ile Asp Pro Ala Arg Thr Pro			
180	185	190	
ctg ctg gcc agg tgg gag gag cgg ttc cgc gcg gac gcg gcc aag			686
Leu Leu Ala Arg Trp Glu Glu Arg Phe Arg Ala Ala Asp Ala Ala Lys			
195	200	205	
ggc gtc gtg ccg gac gac gac aag atg ctc gag ttc ttg ccc acc			734
Gly Val Val Pro Asp Asp Ala Asp Lys Met Leu Glu Phe Leu Pro Thr			
210	215	220	
gtg ctc gct tgg atc gcc ggc aaa gcg aag tgaactgtgt ctgtgaggcc			784
Val Leu Ala Trp Ile Ala Gly Lys Ala Lys			
225	230		
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ctgttaaaaa aaaaaaaaaaa aa			926
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<211> 233			
<212> PRT			
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Phe Val Ile Arg Val Arg Val Val Leu Asn Leu Lys Ser Leu Pro Tyr			
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Glu Tyr Val Glu Glu Ser Leu Gly Ser Lys Ser Ala Leu Leu Leu Gly			
35	40	45	
Ser Asn Pro Val His Gln Ser Val Pro Val Leu Leu His Gly Gly Arg			
50	55	60	
Pro Val Asn Glu Ser Gln Val Ile Val Gln Tyr Ile Asp Glu Val Trp			
65	70	75	80
Ala Gly Ala Gly Pro Ser Val Leu Pro Ala Asp Pro Tyr Glu Arg Ala			
85	90	95	
Thr Ala Arg Phe Trp Ala Ala Tyr Val Asp Asp Lys Val Gly Ser Ala			
100	105	110	
Trp Thr Gly Met Leu Phe Ser Cys Lys Thr Glu Glu Arg Ala Glu			
115	120	125	
Ala Val Ser Arg Ala Val Ala Ala Leu Glu Thr Leu Glu Gly Ala Phe			
130	135	140	
Ala Glu Cys Ser Lys Gly Lys Ala Phe Phe Gly Gly Asp Ala Ile Gly			
145	150	155	160

Phe Val Asp Val Val Leu Gly Gly Tyr Leu Gly Trp Phe Gly Ala Ile
 165 170 175
 Asp Lys Ile Ile Gly Arg Arg Leu Ile Asp Pro Ala Arg Thr Pro Leu
 180 185 190
 Leu Ala Arg Trp Glu Glu Arg Phe Arg Ala Ala Asp Ala Ala Lys Gly
 195 200 205
 Val Val Pro Asp Asp Ala Asp Lys Met Leu Glu Phe Leu Pro Thr Val
 210 215 220
 Leu Ala Trp Ile Ala Gly Lys Ala Lys
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<210> 17

<211> 1043

<212> DNA

<213> *Triticum aestivum* L.

<220>

<221> CDS

<222> (39)...(767)

<223> Glutathione S transferase

<221> gene

<222> (1)...(1043)

<223> cDNA clones ICC, ICP, and ICV

<400> 17

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 Met Ala Gly Gly Glu Glu
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ctg aag ctg ctg ggg tgg tgg gcg ccc ggg gtg agt ccc tac gtg ctg 104
 Leu Lys Leu Leu Gly Trp Trp Ala Pro Gly Val Ser Pro Tyr Val Leu
 10 15 20

cgc gcc cag atg gcg ctc gcc gta aag ggg ctg agc tac gac tac ctc 152
 Arg Ala Gln Met Ala Leu Ala Val Lys Gly Leu Ser Tyr Asp Tyr Leu
 25 30 35

ccc gag gac cgc tgg tcc acg agc gac ctc ctc atc gcg tcc aac ccc 200
 Pro Glu Asp Arg Trp Ser Thr Ser Asp Leu Leu Ile Ala Ser Asn Pro
 40 45 50

gtg tac aag aag gtg ccc gtc ctc att cac aac ggc agg ccc gtc tgc 248
 Val Tyr Lys Lys Val Pro Val Leu Ile His Asn Gly Arg Pro Val Cys
 55 60 65 70

gag tcg ctg ctc atc ctg gag tac ctc gac gac gcc gtc ggc ctt gcc 296
 Glu Ser Leu Leu Ile Leu Glu Tyr Leu Asp Asp Ala Val Gly Leu Ala
 75 80 85

ggc aac ggc aag ccc atc ctc ccc gca gac ccc tac agc cgc gcc gtc 344
 Gly Asn Gly Lys Pro Ile Leu Pro Ala Asp Pro Tyr Ser Arg Ala Val
 90 95 100

gct cgc ttc tgg gcc gcc tat gtg aac gac aag ctg ttc cct tcg tgc Ala Arg Phe Trp Ala Ala Tyr Val Asn Asp Lys Leu Phe Pro Ser Cys 105 110 115	392
acc ggg atc ctc aag act acg aag cag gag gag aga gcc ggt aag atg Thr Gly Ile Leu Lys Thr Lys Gln Glu Arg Ala Gly Lys Met 120 125 130	440
gag gag acc ctg tcc ggg ctc aga cac tta gaa gct gtc atg gcg gag Glu Glu Thr Leu Ser Gly Leu Arg His Leu Glu Ala Val Met Ala Glu 135 140 145 150	488
tgc tcc gaa ggg gag gcg gag ccg ttc ttc ggt ggt gac gcc atc Cys Ser Glu Gly Glu Ala Glu Ala Pro Phe Phe Gly Gly Asp Ala Ile 155 160 165	536
ggg ttc ctc gac atc gcg ctc ggg tgc tat ctt ccc tgg ttt gag gca Gly Phe Leu Asp Ile Ala Leu Gly Cys Tyr Leu Pro Trp Phe Glu Ala 170 175 180	584
gca ggc cgc ctg gcc ggc ttg ggg ccg atc atc gac ccg gcg agg acg Ala Gly Arg Leu Ala Gly Leu Gly Pro Ile Ile Asp Pro Ala Arg Thr 185 190 195	632
ccg aaa cta gct gcg tgg gcg gag ccg ttc agc gtc gcc gag ccg atc Pro Lys Leu Ala Ala Trp Ala Glu Arg Phe Ser Val Ala Glu Pro Ile 200 205 210	680
aag gcg ctg ctg cct ggg gtc gac aag ctg gag gag tac atc act acg Lys Ala Leu Leu Pro Gly Val Asp Lys Leu Glu Glu Tyr Ile Thr Thr 215 220 225 230	728
gcg ctt tat cca aag tgg aac atc gcg gtc acc ggc aac taattaaaga Ala Leu Tyr Pro Lys Trp Asn Ile Ala Val Thr Gly Asn 235 240	777
tcttgcgtt ccactatggc aaaagaaata aaaaagggcg tcgttcgata accggcggag gatctctgcc ttgtgagtag ctgtttcac gtcaagagtt gaactgttac tactaagtctg ggttcttt tgcgagggtt agtgggtcgt ggcatgaat aatgcacagg cgtgcactct cttcgatctg agttgtgata tggtgttcg tgaataaatt gaagcgtcgt cgatcttgca tctaaaaaaa aaaaaaaaaa aaaaaaa	837 897 957 1017 1043
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Leu Ser Tyr Asp Tyr Leu Pro Glu Asp Arg Trp Ser Thr Ser Asp Leu
35 40 45
Leu Ile Ala Ser Asn Pro Val Tyr Lys Lys Val Pro Val Leu Ile His
50 55 60
Asn Gly Arg Pro Val Cys Glu Ser Leu Leu Ile Leu Glu Tyr Leu Asp
65 70 75 80
Asp Ala Val Gly Leu Ala Gly Asn Gly Lys Pro Ile Leu Pro Ala Asp
85 90 95
Pro Tyr Ser Arg Ala Val Ala Arg Phe Trp Ala Ala Tyr Val Asn Asp
100 105 110
Lys Leu Phe Pro Ser Cys Thr Gly Ile Leu Lys Thr Thr Lys Gln Glu
115 120 125
Glu Arg Ala Gly Lys Met Glu Glu Thr Leu Ser Gly Leu Arg His Leu
130 135 140
Glu Ala Val Met Ala Glu Cys Ser Glu Gly Glu Ala Glu Ala Pro Phe
145 150 155 160
Phe Gly Gly Asp Ala Ile Gly Phe Leu Asp Ile Ala Leu Gly Cys Tyr
165 170 175
Leu Pro Trp Phe Glu Ala Ala Gly Arg Leu Ala Gly Leu Gly Pro Ile
180 185 190
Ile Asp Pro Ala Arg Thr Pro Lys Leu Ala Ala Trp Ala Glu Arg Phe
195 200 205
Ser Val Ala Glu Pro Ile Lys Ala Leu Leu Pro Gly Val Asp Lys Leu
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225 230 235 240
Thr Gly Asn

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<211> 24
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<213> Artificial Sequence

<220>
<223> Oligonucleotide primer to introduce NdeI site into
translation start site of ICJ

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